

What is claimed is

1. A method for continuously encapsulating or embedding a component in a matrix comprising:

- a. admixing at least one plasticizable matrix material with at least one plasticizer and at least one component for controlling the rate of release of an encapsulant, said admixing being under low shear conditions to plasticize the plasticizable material without substantially destroying the at least one plasticizable material and to obtain a substantially homogeneous plasticized mass,
- b. reducing the plasticizer content of said plasticized mass,
- c. reducing the temperature of the plasticized mass to obtain a cooled, plasticized mass,
- d. admixing at least one encapsulant with said cooled, plasticized mass to obtain a formable mixture, said admixing being under low shear mixing conditions at a plasticized mass temperature which avoids substantial thermal destruction of said at least one encapsulant,
- e. extruding said formable mixture through a die to obtain an extrudate, and
- f. cutting said extrudate into pieces.

2. A method as claimed in claim 1 wherein said plasticizable material and said plasticizer are admixed and heated above the melt or glass transition temperature of the plasticizable material and then admixed with said at least one release-rate controlling component.

3. A method as claimed in claim 1 wherein said plasticizable material, said plasticizer, and said at least one release-rate controlling component are admixed and then heated above the melt or glass transition temperature of the plasticizable material.

4. A method as claimed in claim 1 wherein said encapsulant is coated with a film-forming material prior to admixing with said cooled, plasticized mass.

5. A method as claimed in claim 1 wherein said pieces are coated with a film-forming material.

5 6. A method as claimed in claim 4 wherein said pieces are coated with a film-forming material.

10 7. A method as claimed in claim 1 wherein said plasticizable matrix material comprises starch, said plasticizer comprises water, and said admixing to obtain a substantially homogenous plasticized mass is conducted with heating to at least substantially gelatinize said starch.

8. A method as claimed in claim 7 wherein said at least one release-rate controlling component is a hydrophobic component.

15 9. A method as claimed in claim 8 wherein said hydrophobic component is at least one member selected from the group consisting of fats, oils, waxes, fatty acids, emulsifiers, polyolefins, polyurethanes, polyvinylchloride, paraffins, polyvinyl acetates, and modified starches.

10. A method as claimed in claim 7 wherein said at least one release-rate controlling component is a high water binding capacity component.

20 11. A method as claimed in claim 10 wherein said high water binding capacity component is selected from the group consisting of proteins, and hydrocolloids.

12. A method as claimed in claim 7 wherein the amount of said at least one release-rate controlling agent is from about 10% by weight to about 35% by weight, based upon the weight of said starch.

13. A method as claimed in claim 12 wherein the starch content of said pieces is at least about 40% by weight, based upon the weight of said pieces.

14. A method as claimed in claim 7 wherein the water content of the plasticized mass is reduced by at least about 10% by weight.

5 15. A method as claimed in claim 1 wherein said plasticizable matrix material comprises a pregelatinized starch or durum wheat flour and said plasticizer is water.

10 16. A method as claimed in claim 7 wherein said encapsulant is admixed with distributive mixing screw sections for a total length of about 3-10 l/d to sufficiently admix, distribute and embed the added ingredients into the matrix.

17. A method as claimed in claim 1 wherein the extrudate is separated into individual pieces using a cutter, pelletizer, rotating knives or counterrotating forming drums that have indented molds to obtain pieces having a length to diameter ratio of between 0.5 and 10.

15 18. An encapsulated product obtained by the method of claim 1 wherein said encapsulant is at least one heat sensitive pharmaceutical component, nutraceutical component, nutritional component, flavor component, fragrance component, detergent or surface-active component, or biologically active component.

20 19. A composition comprising an encapsulated product obtained by the method of claim 1.

20. An encapsulated product obtained by the method of claim 1 wherein said encapsulant is at least one member selected from the group consisting of: acepromazine acetaminophen, acetohexamide, acetohydroxamic acid,

acetylcholine, acetylcysteine acyclovir, albendazole, alclometasone dipropionate ,  
 allopurinol, alprazolam, alprostadil, amcinoides, amantadine, amdinocillin,  
 amikacin amiloride, aminocaproic acid, aminophylline, aminosalicylate ,  
 aminosalicyllic acid, amitriptyline hydrochloride, ammonium chloride,  
 5 amobarbital, amodiaquine hydrochloride, amoxapine, amoxicillin, amphetamine  
 sulfate, amphotericin, ampicillin amprolium, acetazolamide acetyldigoxin,  
 acetylsalicylic acid, anileridine, anthralin, antipyrine, antivenin, apomorphine,  
 apraclonidine, ascorbic acid, aspirin, acromycin atropine, amoxycillin anipamil,  
 azaperone azatadine maleate, azathioprine, azithromycin, aztreonam,  
 10 bacampicillin, bacitracin, baclofen, barium salts, beclomethasone dipropionate,  
 belladonna extract, bendroflumethiazide, benoxinate hydrochloride,  
 benzethonium chloride , benzocaine, benzonatate benzthiazide, benztropine  
 mesylate, betain, betamethasone, betaxolol , betanecol chloride, biotin,  
 biperiden, bisacodyl, bismuth, botulinum antitoxin, bromocriptine mesylate,  
 15 bromodiphenhydramine hydrochloride, bumetanide, bupivacaine, busulfan  
 butabarbital sodium, butalbital, combinations of butalbital, caffeine and aspirin  
 and codeine, beta-carotene, calcifediol, calcium carbonate, calcium citrate,  
 calcium salts, candicidin, captopril, carbachol, carbamazepine, carbenicillin  
 indanyl sodium, carbidopa, carbinoxamine maleate, carboprost tromethamine,  
 20 carboxymethylcellulose, carisoprodol, casanthranol, cascara, castor oil, cefaclor,  
 cefadroxil, cefamandole nafate, cefazolin, cefixime, cefoperazone, cefotaxime,  
 cefprozil, ceftazidime, cefuroxime axetil, cephalixin, cephradine, chlorambucil,  
 chloramphenicol, chlordiazepoxide, chloroquine phosphate, chlormadinone  
 acetate, chlorothiazide, chlorpheniramine maleate, chloroxylenol, chlorpromazin,  
 25 chlorpropamide, chlorprothixene, chlorprothixene, chlortetracycline bisulfate,  
 chlortetracycline hydrochloride, chlorthalidone, chlorzoxazone, cholecalciferol,  
 cholera vaccine, chromic chloride, chymotrypsin, cimetidine, cinoxazin,  
 cinoxate, ciprofloxacin, cisplatin, clarithromycin, clavulanate potassium,  
 clemastine fumarate, clidinium bromide, clindamycin hydrochloride, -palmitate  
 30 and -phosphate, clioquinol, clofazimine, clofibrate, clomiphene citrate,  
 clonazepam, cinnarizine, clonidine hydrochloride, clorsulon, clotrimazole,

cloxacillin sodium, cyanocobalamin, cocaine, coccidioidin, cod liver oil, codeine,  
 colchicine, colestipol, corticotropin, corisone acetate, cyclacillin, cyclizine  
 hydrochloride, cyclobenzaprine hydrochloride, cyclophosphamide, cycloserine,  
 cyclosporine, cyproheptadine hydrochloride, cysteine hydrochloride, danazol,  
 5 dapson, dehydrocholic acid, demeclocycline, desipramine, desoximetasone,  
 desoxycorticosterone acetate, dexamethasone, dexchlorpheniramine maleate,  
 Dexpanthenol, dextroamphetamine, dextromethorphan, diazepam, diazoxide,  
 dibucaine, dichlorphenamide, dicloxacillin sodium, dicyclomine, dienestrol,  
 10 diethylpropion hydrochlorid, diethylstilbestrol, diflunisal, digitalis, dicoumarol,  
 digitoxin, digoxin, dihydroergotamine, dihydrostreptomycin, dihydrotachysterol,  
 dihydroxyaluminium aminoacetate, dihydroxyaluminium sodium carbonate,  
 diltiazem hydrochloride, dimenhydrinate, dimercaprol, diphenhydramine  
 hydrochloride, diphenoxylate hydrochloride, diphteria antitoxin, dipyrindamole,  
 15 disopyramide phosphate, disulfiram, dobutamine hydrochloride, docusate  
 calcium, docusate sodium, dopamine hydrochloride, doxepin hydrochloride,  
 doxycycline, doxycycline hyclate, doxylamine succinate, dronabinol, droperidol,  
 drotaverine, dydrogesterone, dyphylline, guaifenesin, enalapril maleate,  
 analaprilat, ephedrine, epinephrine, equilin, ergocalciferol, ergoloid mesylates,  
 ergonovine maleate, ergotamine tartrate, erythrityl tetranitrate, erythromycin,  
 20 estradiol, estriol, estrogen, estrone, estropipate, ethcrynac acid, ethambutol  
 hydrochlorid, ethchlorvynol, ethinyl estradiol, ethionamide, ethopropazine  
 hydrochloride, ethotoin, ethynodiol diacetate, etidronate disodium, etoposide,  
 eugenol, famotidine, fenoprofen, ferrous fumarate, ferrous gluconate, ferrous  
 sulfate, flucytosine, fludrocortisone acetate, flunisolide, fluocinolone acetonide,  
 25 fluocinonide, fluorescein sodium, fluorometolone, fluorouracil, fluoxymesterone,  
 fluphenazine, flurandrenolide, flurazepam, flurbiprofen, folic acid, furazolidone,  
 flunitrazepam, furosemide, gemfibrozil, gentamicin, gentian violet, glutarate,  
 glutethimide, glycopyrrolate, chorionic gonadotropin, gramicidin,  
 griseofulvin, guaifenesin, guanabenz, guanadrel sulfate, halazone, haloperidol,  
 30 haloprogin, halothane, heparin calcium, hepatitis virus vaccine, hetacillin  
 potassium, hexylresorcinol, histamine phosphate, histidine, homatropine,

histoplasmin, hydralazine hydrochloride, hydrochlorothiazide, hydrocodone  
bitartrate, hydrocortisone, hexobarbital, hydroflumethiazide, hydromorphone  
hydrochloride, hydroquinone, hydroxocobalamin, hydroxyamphetamine,  
hydroxychloroquine sulfate, hydroxyprogesterone caproate, hydroxyurea,  
5 hydroxine hydrochloride, hydroxine pamoate, hyoscyamine, hyoscyamine  
sulfate, ibuprofen, ifosfamide, imipramide, imipramide hydrochloride,  
indapamide, indomethacin, insulin, inulin, iocetamid, iodoquinol, iohexol,  
iopamidol, ipecac, ipodate calcium, ipodate sodium, isocarboxacid, isoetharine  
hydrochloride, isoflurane, isoniazid, isopropamide iodine, isoproterenol  
10 hydrochloride, isosorbide dinitrate, isotretinoin, isoxsuprine hydrochloride,  
kanamycin sulfate, ketoprofen, ketoconazole, labetalol hydrochloride, lanolin,  
leucine, leucovorin calcium, levamisole hydrochloride, levocarnithine, levodopa,  
levonorgestrel, levorphanol tartrate, levothyroxine sodium, lidocaine, lincomycin  
hydrochloride, lindane, liothyronine sodium, liotrix, lisinopril, lithium carbonate,  
15 loperamide hydrochloride, loracarbef, lonetel, lorazepam, lovastatin, loxapine,  
lysine, mafenide acetate, magaldrate, magnesium carbonate, magnesium chloride,  
magnesium gluconate, magnesium oxide, other magnesium salts, malathion,  
manganese salts, manganese, maprotiline hydrochloride, mazindol, measles virus  
vaccine, mebendazole, mebrofenin, mecamlamine hydrochloride, meclizine  
20 hydrochloride, meclizine, meclizine, meclizine, meclizine, meclizine,  
hydrochloride, meclizine, meclizine, meclizine, meclizine, meclizine,  
acetate, mefenamic acid, megestrol acetate, meglumine, melphalan, menadiol  
sodium diphosphate, menadione, menotropine, meperidine, mephénytoin,  
mephobarbital, meprednisone, meprobamate, mercaptopurine, mesoridazine  
besylate, mestranol, metaproterenol sulfate, metaraminol bitartrate, methacycline  
25 hydrochloride, methadone hydrochloride, methamphetamine hydrochloride,  
methazolamide, methdilazine, methenamine, methicillin sodium, methimazole,  
methionine, methocarbamol, methotrexate, methoxsalen, methoxyflurane,  
methsuximide, methyclothiazide, methylbenzethonium chloride, methyl dopa,  
methylergonovine maleate, methylphenidate hydrochloride, methylprednisolone,  
30 methyltestosterone, methysergide maleate, metoclopramide, metolazone,  
meoprolol tartrate, metronidazole, metyrapone, metyrosine, mexiletine

hydrochloride, mexiletine hydrochloride, miconazole, minocycline  
hydrochloride, minoxidil, mitomycin, mitotane, molindone hydrochloride,  
monobenzene, morphine sulfate, mupirocin, medazepam, mefruside,  
methandrostenolone, methylsulfadiazine, nadolol, nafcillin, nafcillin sodium,  
5 nalidixic acid, nalorphine, naloxone, nandrolone decanoate, nandrolone  
phenpropionate, naproxen, natamycin, neomycin, neomycin sulfate, neostimine  
bromide, niacin, nitrofurantoin nalidixic acid, nifedipine, nitrazepam,  
nitrofurantoin, nitroglycerine, nitromerson, nizatidine, nonoxynol 9,  
norethindrone, norethindrone acetate, norfloxacin, norgestrel, nortriptyline  
10 hydrochloride, noscapine, novobiocin sodium, nystatin, opium, oxacillin sodium,  
oxamniquine, oxandrolone, oxazepam, oxprenolol hydrochloride, oxtriphylline,  
oxybenzone, oxybutynin chloride, oxycodone hydrochloride, oxycodone,  
oxymetazoline hydrochloride, oxymetholone, oxymorphone hydrochloride,  
oxyphenbutazone, oxytetracycline, padimate, pancreatin, pancrelipase, papain,  
15 panthenol, papaverin hydrochloride, parachlorophenol, paramethasone acetate,  
paregoric, paromomycin sulfate, penicillamine, penicillin, penicillin derivatives,  
pentaerythritol tetranitrate, pentazocine, pentazocine hydrochloride, pentazocine  
salts, pentobarbital sodium, perphenazine, pertussis, phenacetamide,  
phenazopyridine hydrochloride, phendimetrazine tartrate, phenelzine sulfate,  
20 phenmetrazine hydrochloride, phenobarbital, phenophtalein, phenoxybenzamine  
hydrochloride, phentermine hydrochloride, phenylalanine, phenylbutazone,  
phenylephrine hydrochloride, phenylpropanolamine hydrochloride,  
physostigmine, phytonadione, pilocarpine, pimozide, pindolol, piperazine,  
piroxicam plicamycin, poliovirus vaccine inactivated, polycarbophil, polymyxin  
25 b sulfate, polythiazide, potassium chloride, potassium citrate, potassium  
cluconate, potassium iodine, potassium sodium tartrate, povidone iodine,  
pralidoxime chloride, pramoxine hydrochloride, pramezam, prazepam,  
praziquantel, prazosin hydrochloride, prazosin hydrochloride, prednisolone,  
prilocaine, primaquine, primidone, probenecid, probucol, procainamide  
30 hydrochlorid, procaine hydrochloride, procarbazine hydrochloride,  
prochlorperazine, prochlorperazine maleate, procyclidine hydrochloride,

progesterone, proline, promazine, promazine hydrochloride, promazine,  
 promethazine, promethazine hydrochloride, propafenone hydrochloride,  
 propantheline, proparacaine hydrochloride, propoxycaine hydrochloride,  
 propoxyphene hydrochloride, propoxyphene napsylate, propanolol  
 5 hydrochloride, propylidone, propylthiouracil, propylthiouracil, protriptyline  
 hydrochloride, pseudoephedrine hydrochloride, pumice, pyrantel pamoate,  
 pyrazinamide, pyrethrum extract, pyridostigmine bromide, pyridoxine  
 hydrochloride, pyrilamine maleate, pyrimethamine, pyroxylin, pyrvinium  
 pamoate, phenacetin, phenytoin, prednisone, uinidine gluconate, quinidine  
 10 sulfate, rabies vaccine, racepinephrine ranitidine, rauwolfia serpentina,  
 resorcinol, ribavirin, riboflavin, rifampin, ritodrine, rubella virus vaccine,  
 saccharin, saccharin sodium, salicylamide, salicylic acid, salsalata, scopolamine,  
 secobarbital sodium, selenius acid, selenium sulfate, sennaserine, simethicone,  
 sodium ascorbate, sodium bicarbonate, sodium fluoride, sodium gluconate,  
 15 sodium iodide, sodium lactate, sodium nitrite, sodium ditroprusside, sodium  
 salicylate, spironolactone, stannozolol, streptomycin, sucralfate, sulfacetamide,  
 sulfadiazine, reserpine, sulfadioxine, sulfamerazine, sulfamethazine,  
 sulfamethizole, sulfamethoxazole, sulfamethoxydiazine, sulfapyridin,  
 sulfasalazine, sulfaperin, sulfathiazole, sulfisoxazole, sulfinpyrazone, sulindac,  
 20 suprofen, stilains, tamoxifen citrate, temacepan, terbutaline sulfate, terfenadine,  
 terpin, testolacton, testosterone, tolazamide, tolbutamide, tetracaine, tetracycline,  
 tetrahydrocycline, theophylline, thiabendazole, thiamine hydrochloride, thiamin,  
 thiamylal, thiethylperazine thimerosal, thioguanine , thioridazine hydrochloride,  
 thistrepton, thiotepa, thiothixene, threonine, thyroid, ticarcillin, timolol,  
 25 tioconazole, titaniumdioxide, tolazamide, tolbutamide, tolmetin, tolnaftate,  
 trazodone hydrochloride, tretinoin, triacetin, triamcinolone, triamterene,  
 triazolam, trichorfon, trichlormethiazide, trientine hydrochloride, trifluoperazine  
 hydrochloride, triflupromazine, trihexyphenidyl hydrochloride, trimeprazine  
 tartrate, trimethadione, trimethobenzamide hydrochloride, trimethoprim,  
 30 trioxsalen, tripelennamine, triprolidine, trisulfapyrimidine, tropicamide, trypsin,  
 tryptohan, tuberculin, tyloxapol, tyropanoate sodium, tyrosine, tyrothricin,



thyrothricin bethamethasone, thiotic acid, sotalol, salbutamol, norfenefrine,  
silymarin, dihydroergotamine, buflomedil, etofibrate, indometacin, urea, valine,  
valproic acid, vancomycin hydrochloride, vasopressin, verapamil, vidarabine,  
vinblastine, vincristine, vitamins, warfarin, yellow fever vaccine, zinc acetate,  
5 zinc carbonate, zinc chloride, zinc gluconate, beta acetyl digoxin, piroxicam,  
haloperidol, ISMN, amitriptylin, diclofenac, nifedipine, verapamil, pyritinol,  
nitrendipin, doxycycline, bromhexine, methylprdnisolone, clonidine, fenofibrate,  
allopurinol, pirenepine, levothyroxin, tamoxifen, metildigoxin, o-(beta-  
hydroxyethyl)-rutoside, propicillin, aciclovir mononitrate, paracetamol,  
10 naftidrofuryl, pentoxifylline, propafenone, acebutolol, L-thyroxin, tramadol,  
bromocriptine, loperamide, ketotifen, fenoterol, cadobelisate, propanolol,  
enalaprilhydrogen maleate, bezafibrate, ISDN, gallopamil, xantinol nicotinate,  
digitoxin, flunitrazepam, bencyclane, dexapanthenol, pindolol, lorazepam,  
diltiazem, piracetam, phenoxymethylpenicillin, furosemide, bromazepam,  
15 flunarizin, erythromycin, metoclopramide, acemetacin, ranitidin, biperiden,  
metamizole, doxepin, dipotassium chloroazepate, tetrazepam, estramustine  
phosphat, terbutaline, captopril, maprotiline, prazosin, atenolol, glibenclamide,  
cefaclor, etilfrine, cimetidine, theophylline, hydromorphone, ibuprofen,  
primidone, clobazam, oxaceprol, medroxyprogesterone, flecainid, pyridoxal 5  
20 phosphat glutamate, himechromone, etofylline clofibrate, vincamine,  
cinnarizine, diazepam, ketoprofen, flupentixol, molsimine, glibornuride,  
dimetinden, melperone, soquinolol, dihydrocodeine, clomethiazole, clemastine,  
glisoxepide, kallidinogenase, oxyfedrine, baclofen, carboxymethylcysteine,  
thioridazine, betahistine, L-tryptophan, murtol, bromelaine, prenylamine,  
25 salazosulfapyridine, astemizol, sulpiride, benzerazide, dibenzepine,  
acetylsalicylic acid, miconazol, nystatin, ketoconazole, sodium picosulfate,  
coltyramine, gemfibrocil, rifampicin, fluocortolone, mexiletin, amoxicillin,  
terfenadrin, mucopolysaccharide polysulfate, triazolam, mianserin, tiaprofenic  
acid, amezinium metilsulfate, mefloquine, probucol, quinidine, carbamazepine,  
30 L-aspartate, penbutolol, piretanide, aescin amitriptyline, cyproterone, sodium  
valproinate, mebeverine, bisacodyl, 5-aminosalicylic acid, dihydralazine,

magaldrate, phenprocoumon, amantadine, naproxen, carteolol, famotidine, methyldopa, auranofine, estriol, nadolol, levomepromazine, doxorubicin, medofenoxate, azathioprine, flutamide, norfloxacin, fendiline, and prajmalium bitartrate.

5 21. An encapsulated product obtained by the method of claim 1 wherein said encapsulant is at least one member selected from the group consisting of antioxidants, phytochemicals, hormones, vitamins, pro-vitamins, minerals, microorganisms, prebiotics, probiotics, trace elements, essential and/or highly unsaturated fatty acids, antibiotics, nutritional supplements, enzymes, formations containing zidovudine, macromolecular polypeptides, aromatic nitro and nitroso compounds and their metabolites useful as anti-viral and anti tumor agents, HIV protease inhibitors, antibiotics, viruses, pigments, steroids, oligopeptides, dipeptides, amino acids, flavor components, fragrance components, detergents and surface-active components, lipid derivatives of phosphonatides, amphiphilic polymers, adenosine derivatives, sulfated tannins, monoclonal antibodies, and metal complexes of water-soluble texathyrin.

10 22. An encapsulated product obtained by the method of claim 1 wherein said encapsulant is at least one member selected from the group consisting of herbicides, pesticides, insecticides, rhodenticides, and fungicides.

15 23. A composition as claimed in claim 19 which is selected from the group consisting of ready-to-eat breakfast cereals, dessert mixes, baking mixes, baking flour, dinner mixes, yogurt, fruit snacks, microwave popcorn, and grain snacks.

20 24. An encapsulated product obtained by the method of claim 1 wherein said plasticizable matrix material is at least one member selected from the group consisting of starches, cyclodextrins, dextrans, monosaccharides, disaccharides, polyvinylpyrrolidone, copolymers of N-vinylpyrrolidone and vinyl acetate, polyvinyl alcohol, cellulose esters, cellulose ethers, and polyethylene glycol.

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25. An encapsulated product comprising:

discrete, solid particles having a substantially uniform shape and a diameter of up to about 10 mm, wherein each particle comprises a dispersion of an encapsulant dispersed within a substantially homogeneous plasticized mass, said plasticized mass comprising at least about 40% by weight of at least one plasticized matrix material, based on the weight of the final product, at least one plasticizer, and at least one component for controlling the rate of release of the encapsulant.

26. An encapsulated product according to claim 25 wherein said plasticizable matrix material comprises an at least partially gelatinized starch, which starch is not substantially dextrinized.

27. An encapsulated product according to claim 25 wherein said encapsulant is coated with a film-forming material prior to dispersion within said plasticized mass.

28. An encapsulated product according to claim 25 wherein said particles are in the form of a tablet, or a pellet.

29. An encapsulated product according to claim 28 wherein said particles are coated with a film-forming material.

30. An encapsulated product according to claim 25 wherein said at least one release-rate controlling component is a hydrophobic component.

31. An encapsulated product according to claim 30 wherein said hydrophobic component is at least one member selected from the group consisting of fats, oils, waxes, fatty acids, emulsifiers, polyolefins, paraffin, polyvinyl acetate and derivatives thereof, and modified starches.

32. An encapsulated product according to claim 25 wherein said at least one release-rate controlling component is a high water binding capacity component.

33. An encapsulated product according to claim 32 wherein said high water binding capacity component is selected from the group consisting of gelatin, proteins, and hydrocolloids.

34. An encapsulated product according to claim 25 which has a specific density of from about 800 g/liter to about 1500 g/liter.

35. An encapsulated product according to claim 25 wherein the length to diameter (l/d) ratio of said particles is from about 0.1 to about 10.

36. An encapsulated product according to claim 25 wherein said encapsulant is at least one pharmaceutical component, neutraceutical component, nutritional component, flavor component, fragrance component, detergent or surface-active component, or biologically active component.

37. An encapsulated product according to claim 25 wherein said particles have a substantially non-expanded, substantially non-cellular structure.

38. An encapsulated product according to claim 25 wherein said encapsulant is released in an aqueous or gastric juice environment in an amount of no more than from about 10% in about 1 hour to no less than about 90% in about 24 hours.

39. An encapsulated product according to claim 25 wherein the amount of the matrix material is from about 60% by weight to about 95% by weight, based upon the weight of the final product, the amount of said at least one component used to control the rate of release of the encapsulant is from about 5% by weight to about 50% by weight, based upon the weight of the matrix material, and the

amount of said encapsulant is from about 1 % by weight to about 85% by weight, based upon the weight of the matrix material.

40. An encapsulated product according to claim 39 wherein said particles have a diameter of from about 0.5 mm to about 5 mm and a length-to-diameter ratio of about 0.5 to about 2.

41. An encapsulated product according to claim 25 wherein said matrix material comprises a protein.

42. An encapsulated product according to claim 25 wherein said plasticized matrix comprises durum wheat or semolina.

43. An encapsulated product as claimed in claim 25 wherein said encapsulant is at least one member selected from the group consisting of:

acepromazine, acetaminophen, acetohexamide, acetohydroxamic acid, acetylcholine, acetyl cysteine, acyclovir, albendazole, alclometasone dipropionate, allopurinol, alprazolam, alprostadil, amcinoides, amantadine, amdinocillin, amikacin, amiloride, aminocaproic acid, aminophylline, aminosalicylate, aminosalicylic acid, amitriptyline hydrochloride, ammonium chloride, amobarbital, amodiaquine hydrochloride, amoxapine, amoxicillin, amphetamine sulfate, amphotericin, ampicillin, amprolium, acetazolamide, acetyldigoxin, acetylsalicylic acid, anileridine, anthralin, antipyrine, antivenin, apomorphine, apraclonidine, ascorbic acid, aspirin, acromycin, atropine, amoxicillin, anipamil, azaperone, azatadine maleate, azathioprine, azithromycin, aztreonam, bacampicillin, bacitracin, baclofen, barium salts, beclomethasone dipropionate, belladonna extract, bendroflumethiazide, benoxinate hydrochloride, benzethonium chloride, benzocaine, benzonatate, benzthiazide, benztropine mesylate, betain, betamethasone, betaxolol, betanecol chloride, biotin, biperiden, bisacodyl, bismuth, botulism antitoxin, bromocriptine mesylate, bromodiphenhydramine hydrochloride, bumetanide, bupivacaine, busulfan,

butabarbital sodium, butalbital, combinations of butalbital, caffeine and aspirin  
 and codeine, beta-carotene, calcifediol, calcium carbonate, calcium citrate,  
 calcium salts, candicidin, captopril, carbachol, carbamazepine, carbenicillin  
 indanyl sodium, carbidopa, carbinoxamine maleate, carboprost tromethamine,  
 5 carboxymethylcellulose, carisoprodol, casanthranol, cascara, castor oil, cefaclor,  
 cefadroxil, cefamandole nafate, cefazolin, cefixime, cefoperazone, cefotaxime,  
 cefprozil, ceftazidime, cefuroxime axetil, cephalixin, cephradine, chlorambucil,  
 chloramphenicol, chlordiazepoxide, chloroquine phosphate, chlormadinone  
 acetate, chlorothiazide, chlorpheniramine maleate, chloroxylenol, chlorpromazin,  
 10 chlorpropamide, chlorprothixene, chlorprothixene, chlortetracycline bisulfate,  
 chlortetracycline hydrochloride, chlorthalidone, chlorzoxazone, cholecalciferol,  
 cholera vaccine, chromic chloride, chymotrypsin, cimetidine, cinoxazin,  
 cinoxate, ciprofloxacin, cisplatin, clarithromycin, clavulanate potassium,  
 clemastine fumarate, clidinium bromide, clindamycin hydrochloride, -palmitate  
 15 and -phosphate, clioquinol, clofazimine, clofibrate, clomiphene citrate,  
 clonazepam, cinnarizine, clonidine hydrochloride, clorsulon, clotrimazole,  
 cloxacillin sodium, cyanocobalamin, cocaine, coccidioidin, cod liver oil, codeine,  
 colchicine, colestipol, corticotropin, cortisone acetate, cyclacillin, cyclizine  
 hydrochloride, cyclobenzaprine hydrochloride, cyclophosphamide, cycloserine,  
 20 cyclosporine, cyproheptadine hydrochloride, cysteine hydrochloride, danazol,  
 dapson, dehydrocholic acid, demeclocycline, desipramine, desoximetasone,  
 desoxycorticosterone acetate, dexamethasone, dexchlorpheniramine maleate,  
 Dexpanthenol, dextroamphetamine, dextromethorphan, diazepam, diazoxide,  
 dibucaine, dichlorphenamide, dicloxacillin sodium, dicyclomine, dienestrol,  
 25 diethylpropion hydrochlorid, diethylstilbestrol, diflunisal, digitalis, dicoumarol,  
 digitoxin, digoxin, dihydroergotamine, dihydrostreptomycin, dihydrotachysterol,  
 dihydroxyaluminium aminoacetate, dihydroxyaluminium sodium carbonate,  
 diltiazem hydrochloride, dimenhydrinate, dimercaprol, diphenhydramine  
 hydrochloride, diphenoxylate hydrochloride, diphteria antitoxin, dipyrindamole,  
 30 disopyramide phosphate, disulfiram, dobutamine hydrochloride, docusate  
 calcium, docusate sodium, dopamine hydrochloride, doxepin hydrochloride,



lysine, mafenide acetate, magaldrate, magnesium carbonate, magnesium chloride,  
 magnesium gluconate, magnesium oxide, other magnesium salts, malathion,  
 manganese salts, manganese, maprotiline hydrochloride, mazindol, measles virus  
 vaccine, mebendazole, mebrofenin, mecamlamine hydrochloride, meclizine  
 5 hydrochloride, meclizine, meclizine sodium, medroxyprogesterone  
 acetate, mefenamic acid, megestrol acetate, meglumine, melphalan, menadiol  
 sodium diphosphate, menadione, menotropine, meperidine, mepherytoin,  
 mephobarbital, meprednisone, meprobamate, mercaptopurine, mesoridazine  
 besylate, mestranol, metaproterenol sulfate, metaraminol bitartrate, methacycline  
 10 hydrochloride, methadone hydrochloride, methamphetamine hydrochloride,  
 methazolamide, methdilazine, methenamine, methicillin sodium, methimazole,  
 methionine, methocarbamol, methotrexate, methoxsalen, methoxyflurane,  
 methsuximide, methyclothiazide, methylbenzethonium chloride, methyl dopa,  
 methyl ergonovine maleate, methylphenidate hydrochloride, methylprednisolone,  
 15 methyltestosterone, methysergide maleate, metoclopramide, metolazone,  
 meoprolol tartrate, metronidazole, metyrapone, metyrosine, mexiletine  
 hydrochloride, mexiletine hydrochloride, miconazole, minocycline  
 hydrochloride, minoxidil, mitomycin, mitotane, molindone hydrochloride,  
 monobenzene, morphine sulfate, mupirocin, medazepam, mefruside,  
 20 methandrostenolone, methylsulfadiazine, nadolol, nafcillin, nafcillin sodium,  
 nalidixic acid, nalorphine, naloxone, nandrolone decanoate, nandrolone  
 phenpropionate, naproxen, natamycin, neomycin, neomycin sulfate, neostimine  
 bromide, niacin, nitrofurantoin, nalidixic acid, nifedipine, nitrazepam,  
 nitrofurantoin, nitroglycerine, nitromerson, nizatidine, nonoxynol 9,  
 25 norethindrone, norethindrone acetate, norfloxacin, norgestrel, nortriptyline  
 hydrochloride, noscapine, novobiocin sodium, nystatin, opium, oxacillin sodium,  
 oxamniquine, oxandrolone, oxazepam, oxprenolol hydrochloride, oxtriphylline,  
 oxybenzone, oxybutynin chloride, oxycodone hydrochloride, oxycodone,  
 oxymetazoline hydrochloride, oxymetholone, oxymorphone hydrochloride,  
 30 oxyphenbutazone, oxytetracycline, padimate, pancreatin, pancrelipase, papain,  
 panthenol, papaverin hydrochloride, parachlorophenol, paramethasone acetate,



paregoric, paromomycin sulfate, penicillamine, penicillin, penicillin derivatives, pentaerythritol tetranitrate, pentazocine, pentazocine hydrochloride, pentazocine salts, pentobarbital sodium, perphenazine, pertussis, phenacemide, phenazopyridine hydrochloride, phendimetrazine tartrate, phenelzine sulfate, phenmetrazine hydrochloride, phenobarbital, phenolphthalein, phenoxybenzamine hydrochloride, phentermine hydrochloride, phenylalanine, phenylbutazone, phenylephrine hydrochloride, phenylpropanolamine hydrochloride, physostigmine, phytonadione, pilocarpine, pimozide, pindolol, piperazine, piroxicam, plicamycin, poliovirus vaccine inactivated, polycarbophil, polymyxin b sulfate, polythiazide, potassium chloride, potassium citrate, potassium gluconate, potassium iodine, potassium sodium tartrate, povidone iodine, pralidoxime chloride, pramoxine hydrochloride, pramezam, prazepam, praziquantel, prazosin hydrochloride, prazosin hydrochloride, prednisolone, prilocaine, primaquine, primidone, probenecid, probucol, procainamide hydrochloride, procaine hydrochloride, procarbazine hydrochloride, prochlorperazine, prochlorperazine maleate, procyclidine hydrochloride, progesterone, proline, promazine, promazine hydrochloride, promazine, promethazine, promethazine hydrochloride, propafenone hydrochloride, propantheline, proparacaine hydrochloride, propoxycaine hydrochloride, propoxyphene hydrochloride, propoxyphene napsylate, propanolol hydrochloride, propylidone, propylthiouracil, propylthiouracil, protriptyline hydrochloride, pseudoephedrine hydrochloride, pumice, pyrantel pamoate, pyrazinamide, pyrethrum extract, pyridostigmine bromide, pyridoxine hydrochloride, pyrilamine maleate, pyrimethamine, pyroxylin, pyrvinium pamoate, phenacetin, phenytoin, prednisone, quinidine gluconate, quinidine sulfate, rabies vaccine, racepinephrine, ranitidine, rauwolfia serpentina, resorcinol, ribavirin, riboflavin, rifampin, ritodrine, rubella virus vaccine, saccharin, saccharin sodium, salicylamide, salicylic acid, salsalata, scopolamine, secobarbital sodium, selenius acid, selenium sulfate, sennaserine, simethicone, sodium ascorbate, sodium bicarbonate, sodium fluoride, sodium gluconate, sodium iodide, sodium lactate, sodium nitrite, sodium ditroprusside, sodium



metamizole, doxepin, dipotassium chlorazepate, tetrazepam, estramustine phosphate, terbutaline, captopril, maprotiline, prazosin, atenolol, glibenclamide, cefaclor, etilfrine, cimetidine, theophylline, hydromorphone, ibuprofen, primidone, clobazam, oxaceprol, medroxyprogesterone, flecainid, pyridoxal 5 phosphate glutamate, himechromone, etofylline clofibrate, vincamine, cinnarizine, diazepam, ketoprofen, flupentixol, molsimine, glibornuride, dimetinden, melperone, soquinolol, dihydrocodeine, clomethiazole, clemastine, glisoxepide, kallidinogenase, oxyfedrine, baclofen, carboxymethylcysteine, thioridazine, betahistine, L-tryptophan, murtol, bromelaine, prenylamine, salazosulfapyridine, astemizol, sulpiride, benzerazide, dibenzepine, acetylsalicylic acid, miconazol, nystatin, ketoconazole, sodium picosulfate, coltyramine, gemfibrocil, rifampicin, fluocortolone, mexiletin, amoxicillin, terfenadrin, mucopolysaccharide polysulfate, triazolam, mianserin, tiaprofenic acid, amezinium methylsulfate, mefloquine, probucol, quinidine, carbamazepine, L-aspartate, penbutolol, piretanide, aescin, amitriptyline, cyproterone, sodium valproinate, mebeverine, bisacodyl, 5-aminosalicylic acid, dihydralazine, magaldrate, phenprocoumon, amantadine, naproxen, carteolol, famotidine, methyldopa, auranofine, estriol, nadolol, levomepromazine, doxorubicin, medofenoxate, azathioprine, flutamide, norfloxacin, fendiline, and prajmalium bitartrate.

44. A food product comprising an encapsulated product according to claim 25.

45. An edible product for human or animal consumption comprising an encapsulated product according to claim 25.

46. An encapsulated product according to claim 25 wherein said encapsulant is at least one member selected from the group consisting of antioxidants, phytochemicals, hormones, vitamins, pro-vitamins, minerals, microorganisms, prebiotics, probiotics, trace elements, essential and/or highly unsaturated fatty acids, antibiotics, nutritional supplements, enzymes, formations containing

5 zidovudine, macromolecular polypeptides, aromatic nitro and nitroso compounds and their metabolites useful as anti-viral and anti-tumor agents, HIV protease inhibitors, antibiotics, viruses, pigments, steroids, oligopeptides, dipeptides, amino acids, flavor components, fragrance components, detergents and surface-active components, lipid derivatives of phosphonatides, amphiphilic polymers, adenosine derivatives, sulfated tannins, monoclonal antibodies, and metal complexes of water-soluble texathyrin.

10 47. An encapsulated product according to claim 25 wherein said encapsulant is at least one member selected from the group consisting of herbicides, pesticides, insecticides, rodenticides, and fungicides.

15 48. A composition comprising an encapsulated product according to claim 25.

49. A composition comprising an encapsulated product as claimed in claim 25 which is selected from the group consisting of ready-to-eat breakfast cereals, dessert mixes, baking mixes, baking flour, dinner mixes, yogurt, fruit snacks, microwave popcorn, grain snacks, animal feed, pet food, pharmaceutical products, and detergents.

SUB  
c 2  
20 50. An encapsulated product according to claim 25 wherein said plasticizable matrix material is at least one member selected from the group consisting of starches, cyclodextrins, dextrins, monosaccharides, disaccharides, polyvinylpyrrolidone, copolymers of N-vinylpyrrolidone and vinyl acetate, polyvinyl alcohol, cellulose esters, cellulose ethers, and polyethylene glycol.

SUB  
DI  
51. An agricultural product comprising an encapsulated product according to claim 25.

52. An encapsulated product comprising:

discrete, solid particles having a substantially uniform shape wherein each particle comprises a uniform dispersion of an encapsulant dispersed within a substantially homogeneous plasticized matrix material, said matrix material comprising at least one member selected from the group consisting of durum wheat, semolina, wheat flour, wheat gluten, soy protein, hydrocolloids, casein, and gelatin, at least one plasticizer, and at least one component for controlling the rate of release of the encapsulant.

SUB  
C3  
10 53. An encapsulated product according to claim 52 wherein said plasticizable matrix material comprises an at least partially gelatinized starch, which starch is not substantially dextrinized.

54. An encapsulated product according to claim 52 wherein said encapsulant is coated with a film-forming material prior to dispersion within said plasticized mass.

SUB  
D1  
15 55. An encapsulated product according to claim 52 wherein said particles are in the form of a tablet, or a pellet.

56. An encapsulated product according to claim 52 wherein said particles are spherical.

20 57. An encapsulated product according to claim 55 wherein said particles are coated with a film-forming material.

58. An encapsulated product according to claim 52 wherein said at least one release-rate controlling component is a hydrophobic component.

59. An encapsulated product according to claim 58 wherein said hydrophobic component is at least one member selected from the group consisting of fats, oils, waxes, fatty acids, emulsifiers, polyolefins, paraffin, polyvinyl acetate and derivatives thereof, and modified starches.

5 60. An encapsulated product according to claim 52 wherein said at least one release-rate controlling component is a high water binding capacity component.

61. An encapsulated product according to claim 52 which has a specific density of from about 800 g/liter to about 1500 g/liter.

10 62. An encapsulated product according to claim 52 wherein the length to diameter (l/d) of said particles is from about 0.1 to about 10.

63. An encapsulated product according to claim 52 wherein said encapsulant is at least one pharmaceutical component, neutraceutical component, nutritional component, flavor component, fragrance component, detergent or surface-active component, or biologically active component.

15 64. An encapsulated product according to claim 52 wherein said particles have a substantially non-expanded, substantially non-cellular structure.

65. An encapsulated product according to claim 52 wherein said encapsulant is released in an aqueous or gastric juice environment in an amount of no more than from about 10% in about 1 hour to no less than about 90% in about 24 hours.

20 66. An encapsulated product according to claim 52 wherein the amount of said at least one component for controlling the rate of release of the encapsulant is up to about 70 / by weight, based on the weight of the matrix material.

67. An encapsulated product according to claim 52 wherein said particles have a diameter of from about 0.5 mm to about 5 mm and a length-to-diameter ratio of about 0.5 to about 2.

68. An encapsulated product according to claim 52 wherein said matrix material comprises a protein.

69. An encapsulated product according to claim 52 wherein said matrix material comprises at least one member selected from the group consisting of durum wheat, semolina, wheat flour, wheat gluten, and soy protein.

70. An encapsulated product according to claim 52 wherein said matrix material comprises at least one member selected from the group consisting of durum wheat and semolina.

71. An encapsulated product as claimed in claim 52 wherein said encapsulant is at least one member selected from the group consisting of:  
acepromazine, acetaminophen, acetohexamide, acetohydroxamic acid,  
acetylcholine, acetyl cysteine, acyclovir, albendazole, alclometasone  
dipropionate, allopurinol, alprazolam, alprostadil, amcinolide, amantadine,  
amdinocillin, amikacin, amiloride, aminocaproic acid, aminophylline,  
aminosalicylate, aminosalicylic acid, amitriptyline hydrochloride, ammonium  
chloride, amobarbital, amodiaquine hydrochloride, amoxapine, amoxicillin,  
amphetamine sulfate, amphotericin, ampicillin, amprolium, acetazolamide,  
acetyldigoxin, acetylsalicylic acid, anileridine, anthraline, antipyrine, antivenin,  
apomorphine, apraclonidine, ascorbic acid, aspirin, acromycin, atropine,  
amoxicillin, anipamil, azaperone, azatadine maleate, azathioprine, azithromycin,  
aztreonam, bacampicillin, bacitracin, baclofen, barium salts, beclomethasone  
dipropionate, belladonna extract, bendroflumethiazide, benoxinate hydrochloride,  
benzethonium chloride, benzocaine, benzonatate, benzthiazide, benztropine  
mesylate, betain, betamethasone, betaxolol, betanecol chloride, biotin,

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biperiden, bisacodyl, bismuth, botulism antitoxin, bromocriptine mesylate, bromodiphenhydramine hydrochloride, bumetanide, bupivacaine, busulfan, butabarbital sodium, butalbital, combinations of butalbital, caffeine and aspirin and codeine, beta-carotene, calcifediol, calcium carbonate, calcium citrate, calcium salts, candicidin, captopril, carbachol, carbamazepine, carbenicillin indanyl sodium, carbidopa, carbinoxamine maleate, carboprost tromethamine, carboxymethylcellulose, carisoprodol, casanthranol, cascara, castor oil, cefaclor, cefadroxil, cefamandole nafate, cefazolin, cefixime, cefoperazone, cefotaxime, cefprozil, ceftazidime, cefuroxime axetil, cephalixin, cephradine, chlorambucil, chloramphenicol, chlordiazepoxide, chloroquine phosphate, chlormadinone acetate, chlorothiazide, chlorpheniramine maleate, chloroxylenol, chlorpromazin, chlorpropamide, chlorprothixene, chlorprothixene, chlortetracycline bisulfate, chlortetracycline hydrochloride, chlorthalidone, chlorzoxazone, cholecalciferol, cholera vaccine, chromic chloride, chymotrypsin, cimetidine, cinoxazin, cinoxate, ciprofloxacin, cisplatin, clarithromycin, clavulanate potassium, clemastine fumarate, clidinium bromide, clindamycin hydrochloride, -palmitate and -phosphate, clioquinol, clofazimine, clofibrate, clomiphene citrate, clonazepam, cinnarizine, clonidine hydrochloride, clorsulon, clotrimazole, cloxacillin sodium, cyanocobalamin, cocaine, coccidioidin, cod liver oil, codeine, colchicine, colestipol, corticotropin, cortisone acetate, cyclacillin, cyclizine hydrochloride, cyclobenzaprine hydrochloride, cyclophosphamide, cycloserine, cyclosporine, cyproheptadine hydrochloride, cysteine hydrochloride, danazol, dapson, dehydrocholic acid, demeclocycline, desipramine, desoximetasone, desoxycorticosterone acetate, dexamethasone, dexchlorpheniramine maleate, Dexpanthenol, dextroamphetamine, dextromethorphan, diazepam, diazoxide, dibucaine, dichlorphenamide, dicloxacillin sodium, dicyclomine, dienestrol, diethylpropion hydrochlorid, diethylstilbestrol, diflunisal, digitalis, dicoumarol, digitoxin, digoxin, dihydroergotamine, dihydrostreptomycin, dihydrotachysterol, dihydroxyaluminium aminoacetate, dihydroxyaluminium sodium carbonate, diltiazem hydrochloride, dimenhydrinate, dimercaprol, diphenhydramine hydrochloride, diphenoxylate hydrochloride, diphteria antitoxin, dipyridamole,



disopyramide phosphate, disulfiram, dobutamine hydrochloride, docusate  
 calcium, docusate sodium, dopamine hydrochloride, doxepin hydrochloride,  
 doxycycline, doxycycline hydrate, doxylamine succinate, dronabinol, droperidol,  
 drotaverine, dydrogesterone, dyphylline, guaifenesin, enalapril maleate,  
 5 analaprilat, ephedrine, epinephrine, equilin, ergocalciferol, ergoloid mesylates,  
 ergonovine maleate, ergotamine tartrate, erythrityl tetranitrate, erythromycin,  
 estradiol, estriol, estrogene, estrone, estropipate, ethcrynac acid, ethambutol  
 hydrochloride, ethchlorvynol, ethinyl estradiol, ethionamide, ethopropazine  
 hydrochloride, ethotoin, ethynodiol diacetate, etidronate disodium, etoposide,  
 10 eugenol, famotidine, fenoprofen, ferrous fumarate, ferrous gluconate, ferrous  
 sulfate, flucytosine, fludrocortisone acetate, flunisolide, fluocinolone acetonide,  
 fluocinonide, fluorescein sodium, fluorometolone, fluorouracil, fluoxymesterone,  
 fluphenazine, flurandrenolide, flurazepam, flurbiprofen, folic acid, furazolidone,  
 flunitrazepam, furosemide, gemfibrozil, gentamicin, gentian violet, glutarate,  
 15 glutethimide, glycopyrrolate, chorionic gonadotropin, gramicidin, griseofulvin,  
 guaifenesin, guanabenz, guanadrel sulfate, halazone, haloperidol, haloprogin,  
 halothane, heparin calcium, hepatitis virus vaccine, hetacillin potassium,  
 hexylresorcinol, histamine phosphate, histidine, homatropine, histoplasmin,  
 hydralazine hydrochloride, hydrochlorothiazide, hydrocodone bitartrate,  
 20 hydrocortisone, hexobarbital, hydroflumethiazide, hydromorphone  
 hydrochloride, hydroquinone, hydroxocobalamin, hydroxyamphetamine,  
 hydroxychloroquine sulfate, hydroxyprogesterone caproate, hydroxyurea,  
 hydroxine hydrochloride, hydroxine pamoate, hyoscyamine, hyoscyamine  
 sulfate, ibuprofen, ifosfamide, imipramide, imipramide hydrochloride,  
 25 indapamide, indomethacin, insulin, inulin, iocetamid, iodoquinol, iohexol,  
 iopamidol, ipecac, ipodate calcium, ipodate sodium, isocarboxacid, isoetharine  
 hydrochloride, isoflurane, isoniazid, isopropamide iodine, isoproterenol  
 hydrochloride, isosorbide dinitrate, isotretinoin, isoxsuprine hydrochloride,  
 kanamycin sulfate, ketoprofen, ketoconazole, labetalol hydrochloride, lanolin,  
 30 leucine, leucovorin calcium, levamisole hydrochloride, levocarnithine, levodopa,  
 levonorgestrel, levorphanol tartrate, levothyroxine sodium, lidocaine, lincomycin

hydrochloride, lindane, liothyronine sodium, liotrix, lisinopril, lithium carbonate, loperamide hydrochloride, loracarbef, lonetil, lorazepam, lovastatin, loxapine, lysine, mafenide acetate, magaldrate, magnesium carbonate, magnesium chloride, magnesium gluconate, magnesium oxide, other magnesium salts, malathion, manganese salts, manganese, maprotiline hydrochloride, mazindol, measles virus vaccine, mebendazole, mebifenin, mecamlamine hydrochloride, meclizine hydrochloride, meclocycline, meclofenamate sodium, medroxyprogesterone acetate, mefenamic acid, megestrol acetate, meglumine, melphalan, menadiol sodium diphosphate, menadione, menotropine, meperidine, mephentoin, mephobarbital, meprednisone, meprobamate, mercaptopurine, mesoridazine besylate, mestranol, metaproterenol sulfate, metaraminol bitartrate, methacycline hydrochloride, methadone hydrochloride, methamphetamine hydrochloride, methazolamide, methdilazine, methenamine, methicillin sodium, methimazole, methionine, methocarbamol, methotrexate, methoxsalen, methoxyflurane, methsuximide, methylclothiazide, methylbenzethonium chloride, methyl dopa, methylergonovine maleate, methylphenidate hydrochloride, methylprednisolone, methyltestosterone, methysergide maleate, metoclopramide, metolazone, meoprolol tartrate, metronidazole, metyrapone, metyrosine, mexiletine hydrochloride, mexiletine hydrochloride, miconazole, minocycline hydrochloride, minoxidil, mitomycin, mitotane, molindone hydrochloride, monobenzene, morphine sulfate, mupirocin, medazepam, mefruside, methandrostenolone, methylsulfadiazine, nadolol, nafcillin, nafcillin sodium, nalidixic acid, nalorphine, naloxone, nandrolone decanoate, nandrolone phenpropionate, naproxen, natamycin, neomycin, neomycin sulfate, neostimine bromide, niacin, nitrofurantoin, nalidixic acid, nifedipine, nitrazepam, nitrofurantoin, nitroglycerine, nitromerson, nizatidine, nonoxynol 9, norethindrone, norethindrone acetate, norfloxacin, norgestrel, nortriptyline hydrochloride, noscapine, novobiocin sodium, nystatin, opium, oxacillin sodium, oxamniquine, oxandrolone, oxazepam, oxprenolol hydrochloride, oxtriphylline, oxybenzone, oxybutynin chloride, oxycodone hydrochloride, oxycodone, oxymetazoline hydrochloride, oxymetholone, oxymorphone hydrochloride,



sodium ascorbate, sodium bicarbonate, sodium fluoride, sodium gluconate,  
sodium iodide, sodium lactate, sodium nitrite, sodium ditroprusside, sodium  
salicylate, spironolactone, stannozolol, streptomycin, sucralfate, sulfacetamide,  
sulfadiazine, reserpine, sulfadioxine, sulfamerazine, sulfamethazine,  
5 sulfamethizole, sulfamethoxazole, sulfamethoxydiazine, sulfapyridin,  
sulfasalazine, sulfaperin, sulfathiazole, sulfisoxazole, sulfinpyrazone, sulindac,  
suprofen, stilains, tamoxifen citrate, temacepam, terbutaline sulfate, terfenadine,  
terpin, testolacton, testosterone, tolazamide, tolbutamide, tetracaine, tetracycline,  
tetrahydrocycline, theophylline, thiabendazole, thiamine hydrochloride, thiamin,  
10 thiamylal, thiethylperazine thimerosal, thioguanine, thioridazine hydrochloride,  
thistrepton, thiotepa, thiothixene, threonine, thyroid, ticarcillin, timolol,  
tioconazole, titanium dioxide, tolazamide, tolbutamide, tolmetin, tolnaftate,  
trazodone hydrochloride, tretinoin, triacetin, triamcinolone, triamterene,  
15 triazolam, trichorfon, trichlormethiazide, trientine hydrochloride, trifluoperazine  
hydrochloride, triflupromazine, trihexyphenidyl hydrochloride, trimeprazine  
tartrate, trimethadione, trimethobenzamide hydrochloride, trimethoprim,  
trioxsalen, tripelennamine, triprolidine, trisulfapyrimidine, tropicamide, trypsin,  
tryptophan, tuberculin, tyloxapol, tyropanoate sodium, tyrosine, tyrothricin,  
20 thyrothricin betamethasone, thiotic acid, sotalol, salbutamol, norfenefrine,  
silymarin, dihydroergotamine, buflomedil, etofibrate, indomethacin, urea, valine,  
valproic acid, vancomycin hydrochloride, vasopressin, verapamil, vidarabine,  
vinblastine, vincristine, vitamins, warfarin, yellow fever vaccine, zinc acetate,  
zinc carbonate, zinc chloride, zinc gluconate, beta acetyl digoxin, haloperidol,  
ISMN, amitriptylin, diclofenac, nifedipine, verapamil, pyritinol, nitrendipin,  
25 doxycycline, bromhexine, methylprednisolone, clonidine, fenofibrate,  
allopurinol, pirenepine, levothyroxin, tamoxifen, methyldigoxin, o-(beta-  
hydroxymethyl)-rutoside, propicillin, aciclovir mononitrate, paracetamol,  
naftidrofuryl, pentoxifylline, propafenone, acebutolol, L-thyroxin, tramadol,  
bromocriptine, loperamide, ketotifen, fenoterol, cadobelisate, propanolol,  
30 enalaprilhydrogen maleate, bezafibrate, ISDN, gallopamil, xantinol nicotinate,  
digitoxin, flunitrazepam, bencyclane, dexapanthenol, pindolol, lorazepam,

diltiazem, piracetam, phenoxymethylpenicillin, furosemide, bromazepam, flunarizin, erythromycin, metoclopramide, acemetacin, ranitidin, biperiden, metamizole, doxepin, dipotassium chloroazepate, tetrazepam, estramustine phosphate, terbutaline, captopril, maprotiline, prazosin, atenolol, glibenclamide, cefaclor, etilfrine, cimetidine, theophylline, hydromorphone, ibuprofen, primidone, clobazam, oxaceprol, medroxyprogesterone, flecainid, pyridoxal 5 phosphate glutamate, himechromone, etofylline clofibrate, vincamine, cinnarizine, diazepam, ketoprofen, flupentixol, molsimine, glibornuride, dimetinden, melperone, soquinolol, dihydrocodeine, clomethiazole, clemastine, glisoxepide, kallidinogenase, oxyfedrine, baclofen, carboxymethylcysteine, thioridazine, betahistine, L-tryptophan, murtol, bromelaine, prenylamine, salazosulfapyridine, astemizol, sulpiride, benzerazide, dibenzepine, acetylsalicylic acid, miconazol, nystatin, ketoconazole, sodium picosulfate, coltyramine, gemfibrocil, rifampicin, fluocortolone, mexiletin, amoxicillin, terfenadrin, mucopolysaccharide polysulfate, triazolam, mianserin, tiaprofenic acid, amezinium methylsulfate, mefloquine, probucol, quinidine, carbamazepine, L-aspartate, penbutolol, piretanide, aescin, amitriptyline, cyproterone, sodium valproinate, mebeverine, bisacodyl, 5-aminosalicylic acid, dihydralazine, magaldrate, phenprocoumon, amantadine, naproxen, carteolol, famotidine, methyldopa, auranofine, estriol, nadolol, levomepromazine, doxorubicin, medofenoxate, azathioprine, flutamide, norfloxacin, fendiline, and prajmalium bitartrate.

72. A food product comprising an encapsulated product according to claim 52.

73. An encapsulated product according to claim 52 wherein said discrete, solid particles have a diameter of up to about 10 mm.

74. An edible product for human or animal consumption comprising an encapsulated product according to claim 52.

75. An encapsulated product according to claim 52 wherein said encapsulant is at least one member selected from the group consisting of antioxidants, phytochemicals, hormones, vitamins, pro-vitamins, minerals, microorganisms, prebiotics, probiotics, trace elements, essential and/or highly unsaturated fatty acids, antibiotics, nutritional supplements, enzymes, formations containing zidovudine, macromolecular polypeptides, aromatic nitro and nitroso compounds and their metabolites useful as anti-viral and anti-tumor agents, HIV protease inhibitors, antibiotics, viruses, pigments, steroids, oligopeptides, dipeptides, amino acids, flavor components, fragrance components, detergents and surface-active components, lipid derivatives of phosphonatides, amphiphilic polymers, adenosine derivatives, sulfated tannins, monoclonal antibodies, and metal complexes of water-soluble texathyrin.

76. An encapsulated product according to claim 52 wherein said encapsulant is at least one member selected from the group consisting of herbicides, pesticides, insecticides, rodenticides, and fungicides.

77. A composition comprising an encapsulated product according to claim 52.

78. A composition comprising an encapsulated product as claimed in claim 52 which is selected from the group consisting of ready-to-eat breakfast cereals, dessert mixes, baking mixes, baking flour, dinner mixes, yogurt, fruit snacks, microwave popcorn, grain snacks, animal feed, pet food, pharmaceutical products, and detergents.

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e 4 79. An encapsulated product according to claim 52 wherein said plasticizable matrix material is at least one member selected from the group consisting of starches, cyclodextrins, dextrans, monosaccharides, disaccharides, polyvinylpyrrolidone, copolymers of N-vinylpyrrolidone and vinyl acetate, polyvinyl alcohol, cellulose esters, cellulose ethers, and polyethylene glycol.

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80. An agricultural product comprising an encapsulated product according to claim 52.

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81. An encapsulated product according to claim 52 wherein the amount of the matrix material is from about 60% by weight to about 95% by weight, based upon the weight of the final product, the amount of said at least one component used to control the rate of release of the encapsulant is from about 5% by weight to about 50% by weight, based upon the weight of the matrix material, and the amount of said encapsulant is from about 1% by weight to about 85% by weight, based upon the weight of the matrix material.

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82. An encapsulated product according to claim 52 wherein said encapsulant comprises at least one member selected from the group consisting of enzymes and microorganisms.

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83. An encapsulated product comprising:

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discrete, solid particles having a substantially uniform shape wherein each particle comprises a uniform dispersion of an encapsulant dispersed within a substantially homogeneous plasticized matrix material, said matrix material comprising at least one member selected from the group consisting of durum wheat, semolina, vital wheat gluten, soy protein, hydrocolloids, casein, and gelatin, and at least one plasticizer.

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84. An encapsulated product according to claim 83 wherein said matrix material comprises semolina or durum wheat.

85. An encapsulated product according to claim 83 wherein said encapsulant comprises at least one member selected from the group consisting of enzymes and microorganisms.

86. An encapsulated product comprising:  
discrete, solid particles having a substantially uniform shape  
wherein each particle comprises a uniform dispersion of an encapsulant dispersed  
within a substantially homogeneous plasticized matrix material, and at least one  
plasticizer, said matrix material comprising a protein, and said encapsulant  
comprising an enzyme or microorganism.

87. An encapsulated product according to claim 86 wherein said protein is  
derived from a plant source.

88. An encapsulated product according to claim 87 wherein said protein  
comprises gluten.

89. An encapsulated product comprising:  
discrete, solid particles having a substantially uniform shape and a  
particle size of less than 1 mm, wherein each particle comprises a dispersion of  
an encapsulant dispersed within a substantially homogeneous matrix material,  
said matrix material comprising an uncooked starch.